

REMARKS

I. Status of the Claims

Claims 1-10 are pending. Applicants amend claims 1, 7, and 8 in this response. Upon entry of the amendment, claims 1-10 will remain for consideration.

II. Withdrawal of Finality of Last Office Action

Applicants gratefully acknowledge the Office's reconsideration and withdrawal of the Section 102 rejection based on McDaniel.

III. Claim Amendments

Applicants amend claims 1, 7, and 8 to require that the protic medium comprise "an alcohol selected from the group consisting of methanol, ethanol, 1-propanol, 1-butanol, 1-pentanol, 1-hexanol, and 2-ethylhexanol." Support for the amendment appears in the application as originally filed in the paragraph bridging pp. 7 and 8 (i.e., paragraph [0044] of the corresponding published application, US 2006/0063666) and in Examples 1-4.

IV. Response to the Section 103 Rejection

Applicants traverse the rejection of claims 1-10 under 35 U.S.C. § 103(a) as unpatentable over McDaniel (U.S. Pat. No. 4,301,034) in view of Slaugh (U.S. Pat. No. 4,295,999), and they respectfully ask the Examiner to reconsider and withdraw the rejection in view of their amendment and the following remarks.

Applicants claim a process for preparing supported, titanized chromium catalysts (claims 1-6 and 10), catalysts made by the process (claim 7), and olefin polymerization processes that use the catalysts (claims 8 and 9). The process requires, in a single step, contacting a support material with a protic medium having a water content less than 20% by weight and comprising titanium and chromium compounds (claim 1). Optionally, the protic medium is removed, and the resulting precatalyst is calcined and activated by heating it in an oxygen-containing atmosphere (claim 1). Catalysts made by the process are particularly valuable for gas-phase olefin polymerizations, where they provide high productivity and polymers with excellent morphology and good processability; additionally, the catalysts provide good comonomer incorporation and are

productive at low activation temperatures (see U.S. Pat. Appl. Publ. No. 2006/0063666, hereinafter also “the ‘666 publication,” at paragraph [0084]).

As amended herein, Applicants’ claims also require that the protic medium comprise “an alcohol selected from the group consisting of methanol, ethanol, 1-propanol, 1-butanol, 1-pentanol, 1-hexanol, and 2-ethylhexanol.” Examples 1-4 illustrate the invention using methanol.

McDaniel teaches a process for making silicas that are useful for chromatography or as supports for chromium oxide catalysts (Abstract). The silicas are made in a single-phase, controlled hydrolysis of silicate esters (Abstract). McDaniel teaches that a soluble Ti and/or Cr compound can be added “prior to gelling the silica” (col. 2, ll. 7-18), and that a protic organic solvent such as methanol or ethanol can be included in the hydrolysis process for making the silicate esters. (“Most preferably, the alcohol and ester are chosen so that the ester on hydrolysis gives the same alcohol as is already present or at least has the same number of carbon atoms.” Col. 2, ll. 46-49).

In all of McDaniel’s examples, the alcohol reacts with a silicate ester prior to the formation of what Applicants define as a “support.” Additionally, McDaniel adds Ti and Cr components sequentially during formation of the support rather than in a single step to an already-formed support. For example, at col. 5, ll. 43-45, McDaniel teaches: “it is preferred to add the titanium compound before the chromium compound.” Col. 6, ll. 19-23 is also explicit: “Most preferably an alcohol soluble titanium compound is introduced after hydrolysis, then particle growth is carried out and then a water soluble chromium compound is added after which gelation is carried out.”

The Examiner points to one paragraph of McDaniel suggesting that Cr and/or Ti components can be added to a dried silica xerogel (col. 5, ll. 57-65). Missing from this discussion, however, is any suggestion to simultaneously add both Ti and Cr components from an alcohol-containing protic medium, as the amended claims require. As shown in Applicants’ Comparative Example 4, simply changing from an alcohol to a hydrocarbon to deliver Ti and Cr components to the silica produces a significantly different product. Moreover, when considered for all of its teachings, McDaniel clearly prefers to introduce the Ti or Cr prior to formation of a gelled silica. See, for example, col. 6, ll. 19-23; col. 7, ll. 49-62; all of the working examples; and claim 42.

The Examiner concludes that it would have been obvious to use an already-formed silica support in McDaniel’s process to make a catalyst because Slaugh teaches that “silica’ is a known and useful catalyst support material” (Office action, p. 4).

Applicants agree that silica is a known and useful support for making olefin polymerization catalysts, including ones based on Cr and Ti. However, this teaching of Slaugh does little to bolster the Office's obviousness argument.

Slaugh does disclose simultaneous application of Ti and Cr components onto a silica support (see Ex. 1, Part C at col. 5). However, the solutions used contain more than 20 wt.% water (concentrated nitric acid, for example, contains 30 wt.% water) and alcohols are not used. In fact, the reference expressly teaches away from using an alcohol because alcohols react (undesirably) with the aluminum hydride component present. Thus, the solvent must be "substantially anhydrous, non-hydroxyl containing and oxygen-free—water, alcohol and oxygen reacting with aluminum hydride. Suitable solvents are for example, ethers, such as diethyl ether, tetrahydrofuran, pyridine, benzene, toluene, and the like" (col. 3, ll. 45-58).

The Examiner acknowledges that the references do not teach to "contact the silica support with a protic medium having a water content of less than 20% by weight having contained therein a titanium compound and a chromium compound." However, she concludes that it would have been obvious to contact a silica xerogel with a mixture of Ti, Cr, and the protic medium "in the process of McDaniel '034 because he teaches to use the same solvent during the hydrolysis step (See Example I at col. 7, col. 14, claim 46, & col. 2, ln 51)." Applicants respectfully disagree with the conclusion.

The skilled person will appreciate from carefully studying the passages identified by the Examiner that McDaniel's teachings apply only to a process for *producing* a silica support by hydrolysis. There is no suggestion to use the alcohol-containing protic solvent to deposit Ti and Cr components onto an already-made silica support. In McDaniel's Example I, for instance, methanolic chromium acetate is added to the mixture prior to formation of the silica gel (see col. 7, ll. 55-62). Similarly, McDaniel's claim 46 (requiring n-propyl alcohol) refers back to claim 42, where the alcohol solvent is used in the process of hydrolyzing a silicate. In fact, the entire claim, up to and including the introduction of ammonia, relates to a process of forming a silica gel. The skilled person simply does not equate the hydrolysis process used to make a silica gel with a process of depositing metals onto an already-made silica gel particle.

For the reasons outlined above, no skilled person, without Applicants' disclosure, would have concluded that an alcohol solvent should be used to simultaneously deposit Ti and Cr components onto an already-made support. To conclude otherwise from the

combined teachings of McDaniel and Slaugh requires an impermissible level of hindsight reconstruction of the invention using Applicants' disclosure to illuminate the path.

In sum, the skilled person had no reason to suppose that the alcohol solvent required by McDaniel for hydrolyzing the silicate ester to form a silica gel would have any particular value for simultaneously depositing Ti and Cr components onto an already-made support, as Applicants' claims require, and the added teaching of Slaugh that silica is a known catalyst support for Cr and Ti fails to cure this deficiency of McDaniel. The claims therefore meet the patentability requirements of Section 103.

V. Conclusion

Applicants respectfully ask the Examiner to reconsider and withdraw the rejection and pass the case to issue. Applicants invite the Examiner to telephone their attorney at (610) 359-2276 if she believes that a discussion of the application might be helpful.

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